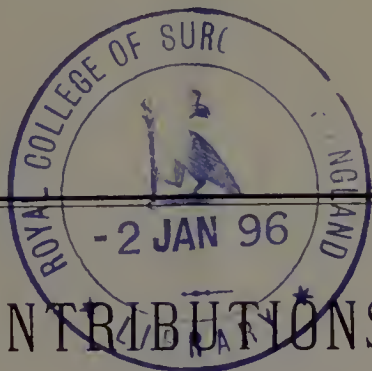


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CONTRIBUTIONS
TO
ORTHOPÆDIC SURGERY.

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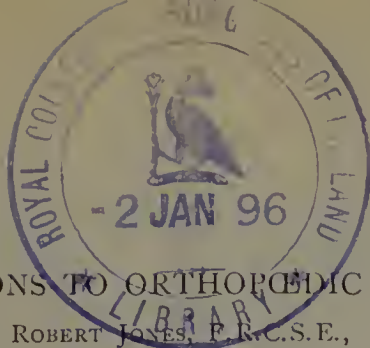
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IX.

Notes on Infantile Paralysis.



CONTRIBUTIONS TO ORTHOPÆDIC SURGERY.

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9. NOTES ON INFANTILE PARALYSIS.

IN dealing with this subject we limit the definition of infantile paralysis to those disabilities resulting from acute anterior polio-myelitis, and only exceptionally refer to other cases with the object of emphasising the differential diagnosis. We, however, mention one form of paralysis which may confront any practitioner, the knowledge of the significance and treatment of which is of considerable advantage. The child is born with an affection of the upper limb, which is observed in a fully extended position; the arm rotated inwards and the hands flexed, generally containing the thumb within its grasp. If such an arm be

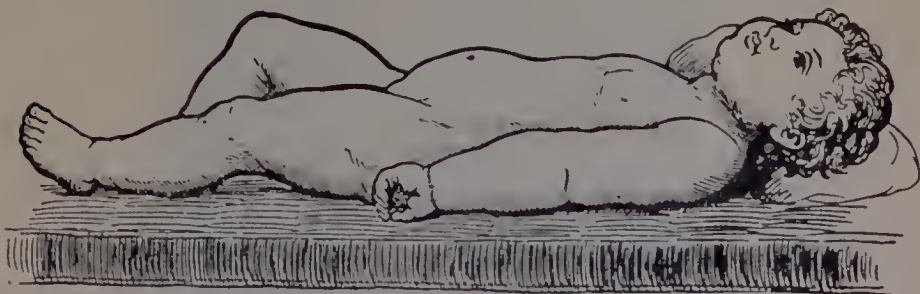


FIG. 1.—Showing the extended arm and flexed hand.

rotated outwards by the surgeon, on release it immediately and almost forcibly resumes its abnormal posture. This condition is by no means uncommon, and is an obstetric form of paralysis due always to injury during birth; it is but rarely accompanied by paralysis of the leg (fig. 1).

Untreated, it is liable on occasions to last for many months, and we have seen cases in which we have been consulted for the thumb and hand flexion even as late as at two years of age. The treatment is simple and very effective, and consists in the reversal of the erratic posture.

Instead of allowing the arm to remain rotated inwards and extended and the wrist and fingers flexed, the indications are to keep the arm rotated outwards, the elbow flexed and the wrist and fingers hyper-extended, while the muscles which have been overcome by their antagonists should be stimulated by friction and massage. Recovery generally takes place in about fourteen days, and this is not in the least aided by electricity.



FIG. 2.

The spinal paralysis of children to which the term polio-myelitis refers is almost exclusively a disease of the second and third years, although cases have been recorded in which the symptoms have been pronounced during the first few days of life, and other stray reports may be found in which symptoms identical with those of polio-myelitis have occurred between the ages of six and twenty. The greater number of cases occur during the second year, and principally during the hot summer months. Well nourished and puny children

are alike subject to these attacks, and no conditions that we know of can be defined as having an ascertained causal relationship to it. Certain it is that we have noted the frequency with which the condition is found amongst the children of mill operatives and in manufacturing communities generally, and we cannot tell whether this is due to the late marriages and the employment of women, or to the degenerate nervous systems of the parents caused by poor food, long hours and wretched hopeless lives. It appears that any condition which renders the nervous system of the infant vulnerable, whether acquired or inherited, due to personal privation or sickness, may be sufficient to invite an attack when extreme summer heat, teething, or intestinal irritation, be added. We have been unable to trace amongst the causative agents a syphilitic, alcoholic, or tubercular diathesis.

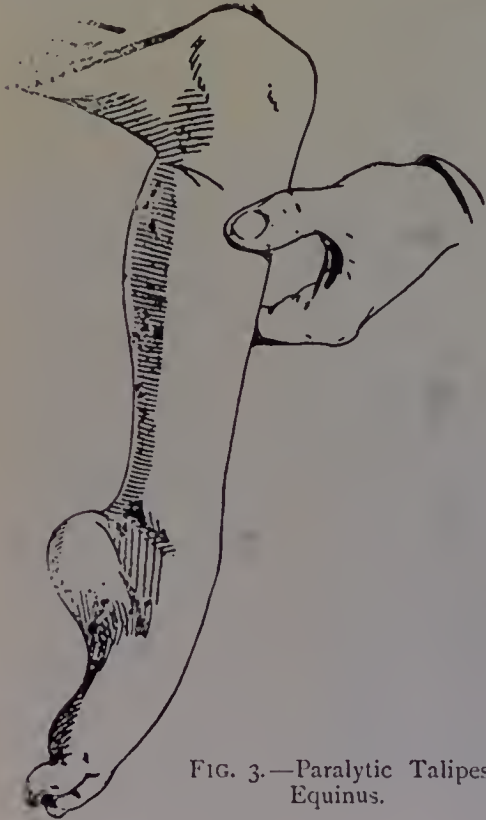


FIG. 3.—Paralytic Talipes Equinus.

A large proportion of cases which come for treatment are not supplied with a history of the onset of the paralysis. Mothers cannot remember, and if they do, they cannot supply detail. In our experience the early history will coincide with one of the following groups:

Group 1.—A child is suddenly taken ill. The symptoms are those of a feverish cold. Pain is also complained of in the head and back. There is often a little diarrhoea. For four or five days the temperature varies from 99° to 102° . On examining the limbs paralysis varying in degree will be found.

Group 2.—A child is irritable and “out of sorts” and is put to bed. In the morning it is found that paralysis in one or more limbs has occurred. In other respects the child appears to be well.

Group 3 — A child is suddenly seized with vomiting and convulsions, which may or may not be repeated. This condition may last for a few hours or for several days. As the acute symptoms pass off, the paralysis is noted. It may affect any muscle, or any group of muscles, or any number of muscular groups.

The greater number of cases in our experience correspond in their origin to the first division, while only a very few exhibit cerebral symptoms. In nearly all, the onset of the paralysis is sudden and attains its maximum at once. Subsequent events are uncertain. Sometimes, in a few days several of the paralysed muscles show signs of improvement (fig. 2). If the arm and leg or both legs be paralysed, recovery may take place completely in all excepting perhaps



FIG. 4.

a single muscle, or a single group of muscles, or a single limb. This may occur in a few weeks, but more generally in a few months. In the arm the deltoid muscle is that most often affected, and frequently associated with it are the biceps, brachialis anticus, supinator longus, and extensors of the fingers. In the leg the antero-external group of muscles, the long extensor of the toes, tibialis anticus, the special extensor of the great toe and the long and short peronei, are the muscles most frequently affected; or the paralysis may include all the muscles of both lower extremities, or one arm and leg, while even some of the trunk muscles may be involved.

Paralysis affecting a whole lower extremity usually does not include the psoas and iliacus muscles, which are still able to swing the limb forward (fig. 3). Paralysis is

diminished or lost while the galvanism formula is reversed, thus exhibiting the reaction of degeneration.

We need only refer in a few words to the pathology in order to make clearer the symptoms. It consists of an acute inflammation of the grey matter of the anterior cornua. There have been only two or three *post-mortem* examinations in fairly recent cases. The one is that reported by Dr. Drummond, where a child five years of age died after a few hours' illness. The spinal cord in the region of the fourth and fifth cervical nerves presented an undue redness. The vessels to the cornua were distended. With the aid of the microscope the capillaries were found to be distended, and small extravasations in the grey matter, swelling of the neuroglia and ganglion cells were also present, the processes from the cells being indistinct.

Damaschino examined the cord of a child two and a half years old who died twenty-six days after an attack. The arm and leg were paralysed. He found spots of red softening in the anterior cornua of the cervical and lumbar regions. The blood vessels were distended, there was marked atrophy of the cells and of the myeline sheaths of



FIG. 5.

the anterior root fibres. Dr. Charwood Turner has reported changes of a similar character, but more advanced in the case of a child who died six weeks after the paralytic onset.

In the absence of an accurate pathology we may rest assured that there is a hyperæmia of the cord which has the effect of destroying temporarily, or for ever, certain ganglion cells in the anterior cornua. These cells having trophic as well as motor functions, any injury to them gives rise not only to certain paralyses, but to impeded circulation and arrest of growth.

When we examine at a late period therefore, we find a shrivelled limb with wasting out of all proportion to that caused by mere desuetude (fig. 4). It feels cold to the

touch, is shorter than its fellow, and usually presents a mottled blue colour. When the affected member is not retained in the normal position during the acute stage, it assumes a position of more or less deformity, the affected muscles being stretched by their unopposed and healthy antagonists. For some time this deformity can be readily overcome, but sooner or later this ceases to be possible, structural shortening having taken place in the healthy or less affected muscle.

The surgical treatment of the paralysis should commence as soon as a diagnosis is made. Space will not admit of a detailed description of the mechanical and operative treatment resorted to in the early and late cases. A few of the more important points, however, will be mentioned. We are very apt, basing unconsciously our practice on the pathology of the ailment, to strike a pessimistic note in our references to polio-myelitis. This is unfortunate and not justifiable. When we state that if practitioners were

alive to the therapeutic and mechanical agencies open to them, we should fail to find any case of paralytic deformity following polio-myelitis, it is a very strong but very true assertion. When we further add that were the contracting deformities no longer amongst us, the



FIG. 6.

chief impediments to the restoration of useful limbs would be also gone, we only very temperately state the position of things. And yet it is rare to find a case of old infantile paralysis which has affected more than a mere group of muscles, without the inevitable deformity. It is not as if the worst deformities occurred in the most hopeless class of cases; on the contrary, the presence of marked deformity bespeaks certain active groups of muscles.

We will divide the surgical treatment of these cases into three divisions: the mechanical preventive treatment; the mechanical treatment of deformity; and the operative treatment

The preventive treatment relates to the prevention of deformity, and aims at disallowing from faults of posture, any advantage to the stronger and less affected groups of muscles.

The principles of treatment in the arm and leg are identical, but for convenience we will deal with the limbs separately.

(1) *The Arm.*—

As we have shown we may have any, or all, of the muscles affected, but it is very unusual to find more than certain groups paralysed (fig. 4); in the upper arm, the deltoid, biceps, brachialis anticus, and often the triceps; in the forearm the supinator longus and the extensors of the fingers (figs. 5, 6, 7). We shall be helped in



[FIG. 7.

deciding on our preventive treatment if we try to recall the old untreated cases which we have seen.

If the upper arm has been mainly affected we notice first of all a total inability to flex the elbow, and a lax condition of the shoulder joint due to deficient muscular

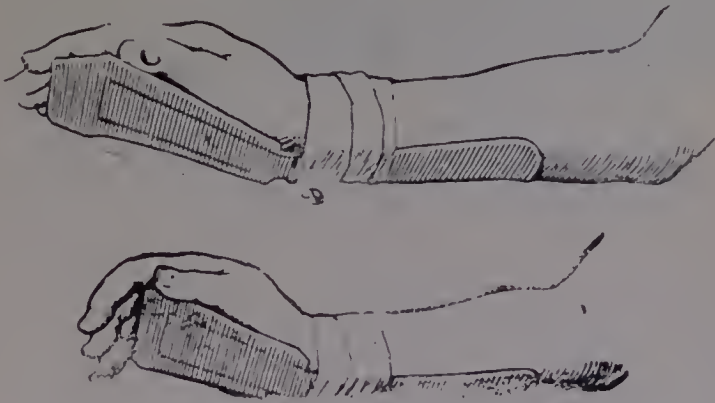


FIG. 8.—Splints for keeping hand hyper-extended in wrist-drop.

control. We can place the head of the humerus into almost any of the classic dislocations. If the lower arm be mainly at fault the deformity nearly always is a flexion of the wrist, with a varying degree of finger flexion.

What we have to do therefore is to anticipate and therefore prevent these disabilities (fig. 8). The wrist should be kept hyper-extended by means of a light splint ; the elbow flexed by means of a bandage or leather halter applied round the wrist and neck, and the head of the humerus should be kept in apposition to the glenoid cavity. So much for the mere mechanical routine. This should be aided three or four times a day with massage shorn of the occult and mystic. The nurse or mother should be instructed how to beat and pinch every bit of affected muscular tissue for about ten minutes at a time. What is aimed at is a bruising of the muscles. We generally get the attendant first to make three or four firm pinches with all the fingers at the deltoid in three or four places ; the same with the biceps, triceps, etc. Then with the end of the fingers he gives the whole arm a short beating, then a good rub. If this be done constantly the circulation of the arm is surely improved ; the deltoid and biceps, if partial recovery in the motor area should occur, have not to recover from the terrible disadvantage of



FIG. 9.

being overstretched and lengthened, and any undue advantage which posture and shortening of muscles might give to the flexors is certainly avoided. How long should such treatment continue ? For fully 12 or 18 months unless marked indications of unusually rapid recovery are observed ! If the

child should move

the arm freely, splint and all ; or easily lift its fingers from the splint which already extends them, a trial might be given the arm (fig. 9). Should inequality between muscle groups become evident, treatment should at once be resumed.

(2) *The Leg*.—The deformities which we meet with in neglected cases are : talipes equinus ; talipes equino varus ; talipes equino valgus ; talipes varus ; contraction of knee ; contraction of hip ; knock knee.

These deformities are often accompanied by abduction and eversion. The same instructions should be followed with regard to muscle beating and muscle pinching, as have been given in the case of the arm. Friction should be most

perseveringly employed, inasmuch as the nutritive deficiencies in the leg are more pronounced than in the arm. As soon as the child is old enough to walk (and until it is old enough to walk it should not be allowed to bend its knee) we apply a Thomas's calliper splint both to facilitate progression and to so develop the psoas and iliacus as to enable them



FIG. 10.

to easily push the limb steadily forward. The boot in which the splint is fitted keeps the foot from any equinus tendency, and should any recovery take place in the cells governing the extensors of the foot, the quadriceps, or the sartorius, the disability caused by stretching and elongation of muscle-tissue, will not have to be contended against, and flexion deformity at the knee will be impossible. We endeavour therefore to prevent deformity and disability in the foot by

keeping it flexed, thus strengthening the dorsal flexors. This is equivalent to antagonising the contending action of gravity which emphasises the deformity of the wrist, elbow, foot, and knee. At first sight one would think that gravity would never tend to cause flexion of the knee, but when we consider the assistant effort of the psoas and iliacus the position of the leg becomes fully explained. Should both limbs be affected the same treatment should be adopted, but if there be a tendency during the later months to contraction at the hips it may be necessary to lay the infant upon a modification of a double Thomas hip splint with rectangular supports for the feet.

Treatment of Wrist Drop of Old Standing.—In dealing with old neglected cases of infantile paralysis we have to carefully discriminate between the loss of power in a muscle and the loss of utility in it due to structural shortening (figs. 4, 5). This can best



FIG 11.

be demonstrated by dealing with our proceedings in the case of the common paralytic deformity known as dropped wrist. It will astonish most physicians and surgeons when we state that in the vast proportion of cases where the flexor muscles are contracted and where there is no power of extension of the wrist, recovery is attainable after many years of disuse. Before entering into any explanations of the fact, we will, contrary to the usage of the "Annual," give outline sketches of three cases which will serve as types.

V. L.—, aged twenty, residing at West Kirby, was brought to one of the authors in 1885. For eighteen years he had not used his wrist, which had remained flexed at an acute angle. The patient was able to moderately extend both wrist and fingers by using the other hand to do it. It would immediately resume the old position on the removal of the force. He was able to hold light objects in his hand if carefully placed there, so long as the position of acute flexion was maintained. During his early years he had undergone much treatment, but for ten years the condition had been looked upon as hopeless. He had spared no

expense in endeavouring to obtain aid, and had consulted some of the best of our physicians and surgeons. Apart from the usual applications of electric remedies, warmth, etc., nothing was suggested, and the prognosis was sufficiently hopeless to discourage him from all effort. On examining him we assured him that in from twelve to eighteen months, co-ordination would return, and he would be able to use his hand and wrist for all practical purposes (fig. 10). In less than two years he was carving wooden organ pipes, and had full restoration of movement in the wrist and fingers. This case was exhibited at the Liverpool Medical Institution.

A young lady, aged seventeen, resident in Southport, was sent to one of the authors by his friend, Dr. Charles Lee, of



FIG. 12.

Liverpool. For fourteen years, following an attack of poliomyelitis, she had not been able to use her hand or wrist excepting very imperfectly in a fully flexed position. Her social position was such that no

expense was spared in endeavouring to overcome the deformity and to render the limb useful, but with no success, and for ten years all treatment had been suspended. She almost apologised for consulting us, as she felt so convinced of her utter hopelessness. We were able, after a short examination, to give a hopeful prognosis, and in less than two years she recovered the use of fingers and wrist, the hand, however, in repose maintaining some slight adduction (fig. 11).

S. B—, a youth of fifteen, residing in Liverpool, was the subject of infantile paralysis, involving the upper arm and scapular muscles, and to a lesser degree those on the extensor aspect of the forearm (fig. 4). The arm remained fully extended, with wrist and fingers flexed. Quite casually, the mother while being treated for another ailment, spoke of her trouble regarding her son. For some years treatment had been discontinued, as it had proved of no benefit. Endless journeys had been paid to men of reputation, and finally for two years the little patient had remained in the metropolis in order to undergo gymnastic evolutions under expert advice. We promised a useful hand, but after examination we were unable to speak confidently of the arm (fig. 9).

In twelve months the boy had so far recovered as to be able to keep the wrist in an extended position and move the fingers freely in the normal range. Without splints on, the biceps had so far recovered as to be able for a few seconds to hold the forearm in a position of right angles, and with an effort the triceps could be seen to contract. The thickness of forearm and wrist had very obviously and considerably increased (fig. 12). He continues to improve.

The bare record of these cases, without a note of explanation, would naturally be received by our readers with incredulity, and this would last just so long as the explanation was withheld. The real fact, however, is that the large majority of these patients are not suffering so much from paralysis as from a want of equilibrium between muscular groups due to certain advantages gained by the stronger sets. Let us take any one of the three cases I have reported, and examine the hand. We will first flex the fingers still more acutely, and we will find that the



FIG. 13.

extensors, while the wrist is flexed, will sufficiently act to carry the fingers to the position from which they were further flexed. From this we learn the key to treatment: for we know now that the motor cells in the anterior cornua governing the extensors are not totally destroyed, and that there is some disability greater than the actual paralysis holding the hand down. That this is due primarily to a shortening of the flexors and an elongation of the extensors is practically certain. How this comes about we have no desire to enter into now. Certain it is that treatment must consist of a reversal of the conditions. In other words we must stretch the contracted tendons and shorten the elongated ones. This needs no operative procedure and may be made to depend entirely upon the simplest mechanical contrivance.

The hand is slightly extended and a splint applied. In two or three days it is more extended, until at the end of

a week or two it is kept in the position of full extension upon a plain angular iron splint (figs. 8 and 12). The effect of this is to stretch the contracted flexors, and to keep in a lax condition the overstretched and lengthened extensors. These extensors, as the months roll on, to use a



FIG. 14.

naautical expression, "take in their slack," in other words, they become shorter. The patient, when asked to move his fingers, will be able as recovery goes on, to hold the hand in the extended position, and now that the balance between the two groups of muscles has been restored, the cure has been practically effected (fig. 9). During the whole time, however, that the arm is in a splint, active treatment must be continued. In the first place, no bandage or plaster should surround the arm excepting at the wrist where no muscular tissue exists. Every day the fleshy portion of the extensors should be several times energetically beaten. By such simple treatment as this, which can be practised in the country as well as in the town, and in private practice equally with the hospital, can these neglected and forlorn cripples be made useful and happy. We will not enter into the treatment of neglected paralysis of the upper arm, as it is based on principles identical with those already enunciated, and we will now proceed to discuss treatment as applied to the lower limbs.

Treatment of Paralytic Deformities of Lower Extremities.

In this section we will not discuss the treatment of the various forms of club foot acquired by paralytic contractions, but will confine ourselves to those conditions which essentially prevent a patient from walking. In other words, we will discuss the problem of *how to make a paralytic walk*.

We will take, first, the patient who merely suffers from paralysis of the extensor longus digitorum and its accessories.

He suffers from drop foot due to contraction of the calf muscles and complete or partial paralysis of the dorsal flexors. We first correct the equinus deformity, place his foot in a boot with an iron stem up the back of his leg, so constructed as to prevent extension of the foot during walking. Massage should here also be employed.

Equally common but more serious are those cases where the whole limb is paralysed, cold and discoloured. Such cases may be seen on their crutches almost at any time.

Unable to stand on the limb except by a balancing movement, they generally develop a contraction of the knee, and may be noted by a peculiarity in number of them have of keeping their foot curled around the crutch during progression. It is easy to make the lot of such much more endurable.

In the first place, if there be equinus, one divides the tendo



FIG. 15.

achillis. If valgus, or other deformity, one corrects it or them in the usual way, and then by means of a Thomas knee splint, one endeavours to correct the contraction of the knee. And here we may mention that this contraction may be attacked either by the simplest mechanism or by a division of tendons. Dr. Ridlon generally divides the tendons; Mr. Jones straightens the limb by the use of Thomas splint and pressure pads. Either method will do. As soon as the limb is straightened a cloth top-boot with sufficiently thickened sole is applied, and the Thomas splint cut down so as to run into the heel of the boot. The patient is then instructed to practise walking, and very shortly, with a perineal crutch in the form of a splint, he is enabled to dispense with the ordinary crutch. Sometimes, as is depicted

in the drawing (fig. 20), we have one paralysed limb to deal with and considerable mechanical defect in the other. The patient depicted was sent to us in order that the right leg might be amputated. His left ankle was inverted, and handicapped him in his endeavour to walk (fig. 13), and the paralysis of the tibialis posticus appeared to be complete. His left leg was absolutely powerless and flail, with an extreme valgoid deformity of the ankle. After a very few weeks' treatment the inversion of the left and the eversion of the right foot were corrected, a calliper affixed to his right leg and a side iron to his left boot (fig. 19) and now he is



FIG. 16.



FIG. 17.

able to progress short distances without crutches, and the photo (fig. 13), when compared with the photos (figs. 14 and 15), will at once explain the difference in his appearance.

A similar improvement is noted in the case of S. B——, if figs. 16 and 17 be compared with figs. 18 and 19, and also by comparing the photo of a very helpless paralytic (fig. 20) with that taken after treatment (fig. 21).

Of yet greater interest are those cases where we find the patient is only able to crawl along. By consulting a series of photographs the reader will see the case of E. A. H—— of Milnthorpe, Cumberland. When he consulted us he was only able to crawl from place to place. He was eight years

old, and had been seized with polio-myelitis at the age of three and a half. Treatment of every kind had been applied, and for several weeks he had been an inmate of a large Scotch Infirmary. As is shown (figs. 22 and 23), on being held by an assistant we were able to note the fact that he had acute flexion deformity of both hips, flexion of the knees, genu valgum, and double talipes equinus. Acting on the principle emphasized, we first endeavoured to correct the deformities. One morning we divided his heel tendons and straightened his foot, and then we applied an iron



FIG. 18.



FIG. 19.

frame, not unlike a double Thomas splint, with two bars running along the outside of each stem, reaching from the thigh wings to the leg wings. Upon this the little patient was placed and bandaged, the two side bars governing his knock-knee, and the rest ordained to correct the knee and hip flexions. During the first week on fixing the legs down, the shoulders remained five inches from the splint, and had to be supported by a pillow. This will convey an idea of the acute flexion of the hips. The first photograph (fig. 26) was taken fourteen days after the commencement of treatment. We observe the marked lordosis even then, and the feet now at right angles to the legs. Seven weeks later (fig. 27) we notice the diminishing lordosis due to the

decreasing flexion at the hips, and a few months later we see him lying unsupported on the table (fig. 28). The genu valgum is quite corrected, the flexion at the knees quite gone, the hips almost straight, and the feet at right angles. Later, he has his walking splints applied (fig. 25), and now by the aid of his psoas and iliacus on each side he commences to use his limbs.

Such cases as these teach us to be hopeful, and to be careful to discriminate



FIG. 20.



FIG. 21.

between muscular contractions and absolute paralysis. They also clearly show the importance of rescuing any muscle, be it partially paralysed or not, for the purposes of locomotion or general utility.

It is impossible in our limited space to discuss in full detail the mechanical treatment of all the various deformities dependent on paralysis. We have only attempted to sketch a general outline.

The Operative Treatment of Flail Joints.—The authors recommend where a joint is quite flail and where there is absolutely no muscular government, to stiffen it, so that it may move in one piece. This is done by partially ankylosing the ankle, and completely ankylosing the knee and allowing the psoas and iliacus to carry the leg in one

piece just as it would carry (in the case of an amputation through the thigh) an artificial limb. Such an operation would be employed in the case of A. K. (fig. 24).

The operation practised by Robert Jones consists in opening the joint, and with a scalpel or sharp gouge, peeling the superficial layer of cartilage off the whole articulation in the case of the ankle, and gouging the bone in the case of the knee, keeping the joint completely at rest for some weeks subsequently, and for a long period fitting the limb with a



FIG. 22.



FIG. 23.

simple apparatus which will enable the patient to walk without throwing a strain upon the newly fixed joints. An excision is more than the case requires, and involves a greater sacrifice of tissue than an already shortened limb can spare. To expose the knee, make an incision across the front of the joint, covering fully half its circumference, and curved so as to pass below the lower end of the patella. The flap is turned up and all the vessels ligatured. Next, remove the semi-lunar cartilages, and with sharp, short-bladed knife or gouge, peel away the cartilages and the underlying layer of bone, so as to leave a raw surface over the whole of their extent. The crucial ligaments are generally left intact. The structures are then carefully reunited by deep and superficial sutures, no drainage tube,

of course, being employed, and the wound is well covered with perchloride wood wool wadding.

The operation may be carried out in the ankle joint in one of two ways, according to the circumstances of the case. In old cases, where the foot is deformed and assumes



FIG. 24.—Flail knee and ankle.

the equino-varus variety, the astragalus is well to the front. In such, force the foot into a position of extreme equino-varus, and make an incision immediately in front of the external malleolus, follow the line of the ankle joint for about an inch or more and divide all structures down to the astragalus,

generally only severing the peroneus tertius tendon. If the incision needs enlarging, skin only is cut; further, the other tendons are held aside, and the articulating surface of the astragalus exposed. With a gouge or knife, several grooved portions of the articulating cartilage are removed. If complete bony ankylosis of the ankle be desired it will be necessary to gouge the bone. If a fibrous ankylosis be wished, it will be sufficient to peel off parts of the cartilage. The ankle is kept extended while some pieces of the articulating surfaces of the tibia and fibula are removed. The few vessels are tied, the foot is placed in its normal relation to the leg, and a suture or two close the wound. A pad of wood wool tissue applied over all and firmly bandaged completes the procedure. In other cases the astragalus is more easily approached from behind, and in such, the foot is firmly flexed on the leg and an incision down to the bone is made along the external border of the tendo achillis. The posterior ligament is now freely divided, and the gouging takes place as in the former operation.

No mishap has occurred in any of our series of twenty-six cases. Each wound has healed by first intention, and,

contrary to expectation, those cases where nutritive changes were most marked, healed as readily as those whose nutritive conditions were nearer normal.

There is little or no pain attending the healing of the wound. If we have to operate upon both knee and ankle, we apply two splints, one a flexible metal splint so designed as to permit of easy dressing of the ankle wound, and a Thomas's bed



FIG. 25.

splint for the knee. These can be used admirably in combination. During the stage of getting about, the Thomas splint can be altered to admit of walking, and the ankle is in that way saved from every harmful influence.

We have not included in this list a similar operation which we perform in talipes calcaneus, often accompanied by pes cavus. It gives, to our minds, very much more satisfactory results than the shortening of the tendo achillis suggested by Mr. Willett. Some years ago we operated on several tendons in the manner prescribed by Mr. Willett, but we can only recall two cases where the improvement was maintained for any length of time, and in these, prior to operation, there was considerable muscular power in the muscles related to the tendo achillis and in their opponents. The moment we try to pick up a paralysed tendo achillis, shortened by operation, against the superincumbent body-weight exercised against locomotion, there can be only one result, and that is, a fresh and speedy yielding of the tendon. We must have some vitality in the gastrocnemius and soleus. If Willett's operation, plus scraping of cartilage be performed, we will obtain considerably better results, for on exhibiting the joint from behind we can remove and shorten the tendo

achillis, and erase just sufficient cartilage to limit the action of the ankle to about 10° . The same procedure may with benefit be applied where, in addition to an elongated heel tendon, the tibiales have been completely paralysed, producing a deformity of calcaneo-valgus which cannot be rectified by the hand.



FIG. 26.

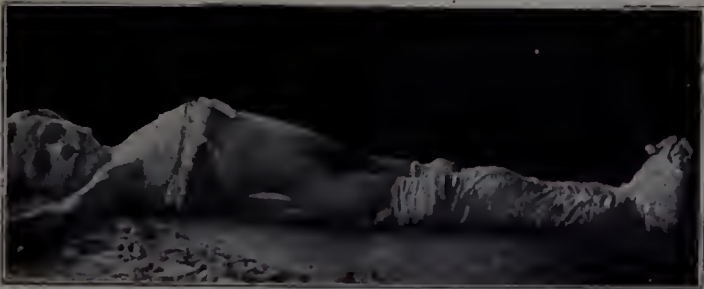


FIG. 27.

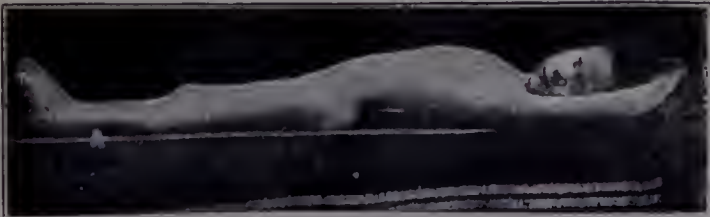


FIG. 28.

By the same Authors :

MONTHLY CONTRIBUTIONS TO ORTHOPÆDIC SURGERY

1. "Principles of Treatment, with some Remarks on the Pathology of Chronic Joint Disease."
2. "Spondylitis: its Symptoms and Diagnosis" (*19 illustrations*).
3. "Spondylitis: its Mechanical and Operative Treatment." (*36 illustrations*).
4. "Sacro-Iliac Disease."
5. "Hip Disease; its Diagnosis and Mechanical Treatment" (*60 illustrations*).
6. "Diseases of the Knee and Ankle" (*35 illustrations*).
7. "Diseases of the Shoulder" (*13 illustrations*).
8. "Diseases of the Elbow, Wrist, and Hand."
9. "Notes on Infantile Paralysis."

TO FOLLOW :

10. "Club Foot."
11. "Surgery of Rickets."
12. "Anchylosis."
13. "Lateral Curvature."

ETC., ETC.

